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ABSTRACT

A study was made of cross-cultural patterns of achievement motivation in relationship to the mathematics achievement of Japanese and American boys and girls approximately 16 years of age. Sample sizes were 9,582 for the United States subjects (specifically, from Illinois) and 1,700 for the participants from Japan. Data came from performance on the High School Mathematics Test, which was administered during the spring term of the 1981-82 testing cycle. The test consisted of 60 items covering a range of mathematical topics, including algebra, geometry, modern math, data interpretation, and probability. A background questionnaire including two measures of achievement motivation (success/failure attributions and test anxiety) was completed by all students during the testing session. Results of correlational analyses revealed a number of associations between (1) gender, test comfort, and attribution variables; and (2) mathematics achievement performance in both within- and between-country comparisons. Specifically discussed are between- and within-country differences in the relationship between gender and mathematics performance, the relationship between test comfort and mathematics achievement performance, and between-country differences in relationships of attribution variables to mathematics achievement performance. It was concluded that current measures of achievement attribution are inadequate to assess motivational patterns in Japan, and that the much higher test scores of the Japanese students do not justify new policy recommendations, given the basic differences between the two countries.

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An Investigation of the Relationship of Achievement Motivation with Achievement in Mathematics for Students in the United States and Japan

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An Investigation of the Relationship of Achievement Motivation With Achievement in Mathematics for Students in the United States and Japan

Introduction

There is increasing concern about the decline in the quality of education within the United States, as represented by the findings of within-country and between-country comparisons. Results of within-country comparisons indicate that while the U.S. continues to allocate a considerable amount of its resources to education, in general, student achievement has declined over the last two decades (Lerner, 1982). Lerner (1982) reports that published data from the Scholastic Achievement Test (SAT) shows that in the mid-to-late 1960's the mean scores of students on this exam began to decline. This slump continued through the end of that decade and through the 1970's. These findings are confirmed by another within-country comparison spanning 50 years at the University of Minnesota. The same standarized tests were administered to samples of students from the same schools in 1928 and 1978, respectively. The results again indicate a substantial decline in mean test scores of students over time (Lerner, 1982).

This investigation reports on recent data collected from a cross-national comparison of mathematics achievement between a representative sample of Japanese students and a random sample of Illinois students from the U.S., approximately 16-years of age. (Hereafter, the sample of Illinois students will be referred to as U.S. students.) The results reveal a substantial gap in mathematics performance (Average student performance for U.S. students was 19.6 compared with an average of

39.6 for Japanese students on a 60-item mathematics test.) indicating not only do the U.S. students of today compare unfavorably with those in the past, but also with this particular foreign peer group.

The U.S. and Japan are "highly developed," technologically-oriented nations, both enjoying a high standard of living with each allocating an equivalent percentage of its Gross National Product to public education (Christopher, 1983). Thus, it appears a superficial examination of basic economic and social patterns reveals few, if any, differences between the two countries. Certainly, there are no social and economic patterns explaining such a superior performance by the Japanese students that is at once disconcerting, challenging, and interesting.

Based on the rather substantial difference in the mean test scores and on research by Hill (1980) which indicates that test performance is influenced by motivational and other factors, it certainly is logical to assume Japanese students are highly motivated, but the issue to be addressed might be phrased in questions, such as, "Why are these students so highly motivated? How are these motivational patterns generated?, and To what extent are there similarities and differences in the motivational patterns for the U.S. and Japanese students?" This study will examine the patterns of motivation and their correlates with mathematics for Japanese and U.S. students.

Historically, theories of achievement motivation, for the most part, have been derived from two major paradigms with interest in this area evolving from the works by McClelland and Atkinson (McClelland, 1961; Atkinson, 1964; Atkinson & Raynor, 1974). Theories of test anxiety were developed from studies by Sarason (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960) with recent reconceptualizations by Hill (1977, 1980). Currently, Weiner's research on achievement which focuses on student

attributions of their successes and failures, has proven to be productive in explaining achievement behavior (Weiner, 1972, 1979). Hill (1976, 1980) has recommended investigating social factors and achievement with an emphasis on test anxiety, as it is an issue in many contexts and appropriate for cross-cultural comparisons. Furthermore, Maehr & Nicholls (1980) have suggested that attribution theory may be particularly functional in identifying sociocultural structures that influence motives associated with achievement. This investigation examines both test anxiety (or lack of test anxiety known as test comfort) and attribution theory and their association with academic achievement as a viable method for identifying cross-cultural similarities and differences in motivational patterns.

Much of the literature in this area begins with Weiner's (1972, 1979) attribution theory which focused upon four major perceived causes of success and failure at achievement tasks: ability, effort, task difficulty, and luck. They are hypothesized to influence both the affective outcomes of success and failure and the expectations of future success or failure. According to this theory, both the affects and expectations influence whether individuals approach or avoid future achievement tasks. Thus, if students believe they are successful at test-taking because of ability rather than luck or ease of task, they are likely to expect to be successful in taking future tests if they elect to put forth the effort. As a result, students develop a positive attitude toward test-taking and tasks in general (Kukla, 1978). Other research by Dweck (1975) indicates that negative attribution is related to low performance.

Willig, Harnisch, Hill, & Maehr (1983) propose that positive attributions are indicative of a sense of competence that is further

associated with positive motivation (Maehr, 1978). They suggest that when an individual's sense of competence is based on the belief that he/she succeeds because of ability rather than luck or ease of task, he/she has more reason to expect future success when he/she elects to put forth the effort. It is these individuals that are characterized as having a high sense of competence. Alternatively, individuals who attribute success to luck and failure to lack of ability are characterized as possessing a low sense of competence. They further suggest that attribution theory, and the high/low sense of competence associated with it, may provide a suitable framework for investigating the relationship between culture and achievement motivation.

From the research on test anxiety, it has been widely accepted that there is a stong association between achievement motivation characterized as some level of test anxiety and student performance on achievement examinations (Atkinson, 1964; Atkins & Raynor, 1974). There is also considerable evidence indicating that there is a negative relationship between test anxiety and test performance in conjunction with school achievement (Ruebush, 1963; Sarason et al. 1960). Hill (1980) proposed that students characterized as low anxiety are more highly motivated to approach success and obtain approval than to avoid failure, with these students still clearly possessing some avoidance motive. High anxious students possess both approach and avoidance motives, but are more motivated to avoid failure than to approach success and obtain approval. With high anxious students, motives to approach achievement are present, but not as strong as motives to avoid failure. Hill (1980) also reports experimental research which suggests that anxiety is the main causal factor in the anxiety performance relationship. These results indicate that there is value in examining anxiety as well as attributions when investigating

achievement motivation.

This study, then, investigates cross-cultural achievement motivation patterns as represented by measures of test anxiety and success-failure attribution and their relationship to mathematics achievement. Distributions of mathematics performance by test anxiety and attribution (ability, effort, luck, and task difficulty in the context of school successes and failures), are examined for Japanese and U.S. students. In particular, descriptive profiles are provided for total math performance by test anxiety and the attributions of success and failure. Further, any within-country differences in test performance by gender are also noted. In addition, efforts are made to interpret the results from these measures in the context of political and sociocultural influences on each country's educational structures.

Method

Description of the Samples

Subjects for the U.S. portion of the sample were students in school districts thoughout the State of Illinois. A random sample of students from the participating schools in the Decade Study (The Decade Study compared the average student performance of a random selection of students from the same representative schools over the past decade.) were selected as part of a research project sponsored by the Illinois State Board of Education. For Japan, a national representative sample of students were selected from public and private schools. The sample sizes were 9,582 and 1,700 for the U.S. and Japan, respectively. A breakdown of the students from both countries by age and sex is presented in Table 1.

(Insert Table 1 here)

Procedures

The data used in this investigation came from the High School Mathematics Test designed by Educational Testing Service (ETS) and administered during the spring term of the 1981-82 testing cycle. The mathematics test consisted of 60 items representing topics which included algebra, geometry, modern math, data interpretation, and probability. A background questionnaire which included assessments of achievement attributions and test anxiety was completed by all students during the testing session. The data for the U.S. described in this study was collected by the Illinois State Board of Education while the data for Japan was collected by Dr. Sato of the Nippon Electric Company in collaboration with a research project at the University of Illinois at Urbana-Champaign.

Assessment of Achievement Attributions

The attributions of success and failure on test-taking activities in school were asked of each student separately. Success attribution (ability, effort, luck, and task ease) and failure attribution (lack of ability, lack of effort, lack of luck, task difficulty) in relationship to test-taking was measured by posing one question each for success and failure, respectively. An abridged version of the questions for the U.S. students, are, "When you do well (poorly) on a test...it is because..." with students selecting one of the following answers for each of the questions: "(a) you are smart (not very smart), (b) you studied very hard (did not study hard enough), (c) you were lucky (not lucky), and (d) the test was easy (not easy)." A similar version of the two questions was composed by a native Japanese scholar for the Japanese students. The questions, which reflected language and cultural differences between the U.S. and Japanese, were completed by the students.

Assessment of Test Anxiety

The level of anxiety, which indicates the test anxiety level of each student, was measured by a 7-item scale reported and validated by Harnisch, Hill, & Fyans (1980). The scale consisted of seven questions to be answered by the student with "Yes" or "No". The questions addressed such issues as whether students liked tests, were they relaxed before and during a test, and did students believe they were going to do good work while taking a test. Again, a similar version of this scale composed by a native Japanese scholar, was included in the background questionnaire completed by the students. These questions, like the assessment of attributions, also reflected linguistic and cultural differences between the U.S. and Japan.

Analyses

To determine the strength of the relationship between attributions of success and failure and test anxiety with mathematics achievement, the correlations of the two variables with mathematics achievement were computed. Further, distributions of mathematics performance by test anxiety and achievement attribution were plotted.

Results

Relationship of Selected Variables with Math Achievement

The strength of the relationships between the test comfort variable, the achievement attribution variables, and the gender (listed as sex in Table 2) variable with mathematics achievement was assessed by determining the correlations of these variables with mathematics achievement. Table 2 presents the correlations between the criterion (mathematics achievement) and the predictors (test comfort, achievement attribution, and gender) which were all statistically significant at an alpha level of .01 for the U.S. and Japanese samples.

(Insert Table 2 here)

As seen in Table 2, the correlation between mathematics achievement and test comfort for the U.S. is relatively strong and in the predicted direction, indicating high test comfort scores are associated with high mathematics achievement scores. The strength of the relationship between these two variables for Japan, however, is only moderately positive with the sign again in the predicted direction indicating a somewhat weaker association between these two variables in that country.

Table 2 also presents the correlation between gender and mathematics achievement for the U.S. and Japan, respectively. The correlation between gender and mathematics achievement in the U.S. is quite weak as expected, indicating no gender differences in test performance. For Japan, on the other hand, a negative correlation is observed, revealing a relatively strong association between gender and mathematics achievement; i.e., Japanese females are associated with lower mathematics achievement scores while Japanese males are associated with higher mathematics achievement scores.

The correlations between mathematics achievement and the achievement attributions are also included in Table 2. These correlations range in size from small negative to moderately positive. An examination of these variables for the U.S. reveals that there is a strong positive relationship between the group of students who believe they do well on tests at school because of their ability and this particular group's mathematics achievement performance. On the other hand, the correlations from the Japanese sample indicate there is a moderate association between students who believe they do poorly on tests because they are unlucky and their mathematics test scores.

In summary, an examination of the correlations of test comfort, gender, and achievement attributions with mathematics performance reveals

some differences in these two countries' motivational patterns as represented by these variables. Of particular interest are the differences in the correlations based on gender in Japan, test comfort in the U.S., and the differential mathematics achievement by the attribution variables for the two countries.

Distributional Characteristics of Selected Variables

In addition to the correlations of these variables with mathematics achievement, tables presenting between- and within-country distributions of the achievement attribution variables and the test comfort variable were prepared. While comparing the response distributions of these variables, a number of interesting similarities and differences were observed. Table 3 presents a between-country comparison of the distribution of the achievement attribution variables.

(Insert Table 3 here)

As can be seen in Table 3, over 50 percent of both samples attributed their test successes to studying hard and their failures to insufficient study. A substantial difference between the two samples was observed for students who indicated their success on tests was due to ability while their failure was attributed to lack of study. Ten percent of the U.S. sample selected this response compared with only 1 percent of the Japanese. Another difference in the selection of the attribution responses is revealed for students who attribute success to sufficient study and failure to exam difficulty. Only 7 percent of the U.S. sample answered these questions in that manner compared with 14 percent of the Japanese. The remaining portions of the samples, for the most part, were distributed evenly within each cell for both countries.

Table 4 presents the between-country comparison of the distribution of the test comfort variable. As indicated by the table, the largest

difference between the two countries in the frequency distributions for this variable are at the extreme ends of the scale. Of particular interest is the proportion of the samples that scored in the high range. For the U.S., 16 percent of the sample received a score of 6 or 7, while only 4 percent of the Japanese students received similar scores.

(Insert Table 4 here)

The within-country distributions of the achievement attribution variables and test comfort variable by gender were also examined. The distribution of the achievement attribution by gender in Japan revealed few differences. Over one-half of the males and females attributed test success and test failure to studying sufficiently, and not studying sufficiently, respectively. Approximately 15 percent of the males and females indicated their success on tests was due to sufficient preparation while their failure was due to lack of luck. The responses by still another 15 percent attributed their success to studying hard and their failure to test difficulty. The distribution of these same variables by gender within the U.S. was quite similar to Japan, with only negligible differences. As in Japan, approximately one-half the males and females attributed test success and test failure to studying sufficiently and insufficient preparation; however, responses from the rest of the sample were distributed almost evenly among the various cells. An examination of the distribution of test comfort by gender in Japan also revealed only negligible differences in how various proportions of the sample scored on the scale. Again, the same phenomenon was observed in the distribution of the test comfort variable by gender in the U.S. Few, if any differences can be noted between proportions of males and females receiving a specific score on the test comfort scale.

In summary, tables featuring between-country comparisons of the

distribution of the achievement attribution variables and test comfort variable were examined. These tables revealed similarities and differences in the response distributions between the two countries. Further, similarities in the within-country comparison of the distribution of the achievement attribution variables and test comfort variable by gender were also noted. The between-country differences in the distributions of the achievement attribution variable for students who indicated their success was due to ability while their failure was attributed to insufficient study were of particular interest.

Box and Whisker Plots of Selected Variables.

To illustrate the distributions of mathematics performance by test comfort, achievement attribution, gender, and various combinations of these variables, "Box and Whisker Plots" were prepared. A box and whisker plot provides a graphical representation of the location of the 25th, 50th, and 75th percentile score with the range of values plus the mean value. The box represents the middle 50 percent of the values while the whisker or tails extending from the box represent the lower and upper quartile values. Values of 0 on the box and whisker plot indicate the probablity occurrences as 1 chance out of 20, while an asterisk indicates the probability of occurrence as 1 chance out of 200. Four of these plots are featured in this section to illustrate the patterns and trends of the selected variables. In Figure 1, the distribution of mathematics performance by scores on the test comfort scale for the U.S. is featured. This plot illustrates the strength and direction of the relationship between these two variables observed in their correlation earlier in this paper. An upward trend in test performance can be seen in relationship to the level of comfort students report; i.e., the more comfortable students report they are when taking tests, the higher their mathematics test scores.

(Insert Figure 1 here)

Figure 2 presents the distribution of mathematics performance by gender for the Japanese sample. Again, the strength and direction of the relationship observed earlier between these two variables is illustrated. A gender difference in mathematics achievement performance is most definitely present as can be seen in this plot. The mean score for Japanese females on the mathematics achievement exam is approximately 6 points less than the mean test score for Japanese males or an effect size of .64.

(Insert Figure 2 here)

Figures 3 and 4 feature the distribution of the patterns of attribution by various mathematics achievement performances for U.S. and Japan, respectively. An examination of Figure 3 clearly reveals two distinct groups of scores with one group possessing the highest mathematics achievement scores and the other possessing the lowest group of scores (See groups 2 and 9, respectively). This clearly illustrates the phenomena that Maehr and Nicholls (1980) have designated as the high and low sense of competence that is associated with the achievement attribution variables. The group rated high in a sense of competence (See group 2 in Figure 3) attributed their success to ability and failure to lack of effort when responding to the achievement attribution questions. As seen in the plot, this group has the highest mean test score among all the groups, approximately 8 points higher than the sample mean test score (28 vs. 19.6). The second group of interest is the one rated low in a sense of competence (See group 9 in Figure 3). Students with a low sense of competence attributed success to luck and failure to lack of ability which is the most debilitating set of attributions (Maehr & Nicholls, 1980). Again, the figure reveals a substantial gap in this group's mean test score

and the overall sample mean test score (15 vs. 19.6) with this group clearly the lowest mathematics achievement performers among all attribution groups. Mathematics achievement performance in this data is clearly associated with the patterns of achievement attribution variables that are hypothesized to be characteristic of one's sense of competence.

(Insert Figure 3 here)

The distributions of the patterns of the achievement attribution variables by mathematics achievement performance for the Japanese sample are given in Figure 4. The attribution patterns that are associated with a high sense of competence and a low sense of competence in the U.S. data are not the same for Japanese data. Rather, at least two patterns seem to be associated with a high sense of competence. The groups which attributed success to ability/luck and failure to lack of effort/no luck, respectively, clearly possessed superior performances on the mathematics achievement examination (46 vs. 39.6). And alternatively, students who attributed their success to effort and failure to lack of ability were associated with a low sense of competence as their mean test score was approximately five points below the sample mean test score (35 vs. 39.6). Definitely, there are different patterns associated with one's sense of competence in Japan than the ones observed in the U.S. data. The differences in the patterns of the achievement attribution variables observed in these two samples will be discussed later in this paper.

(Insert Figure 4 here)

In brief, box and whisker plots featuring the various relationships of test comfort, achievement attribution, gender, and combinations of these variables with mathematics achievement performance were examined. The relationships between the test comfort variable and mathematics achievement performance in the U.S., and the gender variable with test performance in

Japan were highlighted. Of particular interest was the association of the groups with a high or low sense of competence in their respective samples and those groups' mathematics test performance. It was noted that the patterns for the achievement attribution variables associated with a high and low sense of competence appear to be different for the two countries.

Discussion

The present study revealed a number of important associations among the gender, test comfort, and attribution variables with mathematics achievement performance within and between the U.S. and Japan, respectively. The relationships among the gender variable, the test comfort variable, and the patterns of the attribution variables in the U.S. data supported previous findings (Harnisch, in press; Hill, 1980; Willig et al., 1983). The association among the gender and test comfort variables in the Japanese data also were as expected (Harnisch, in press; Hill, 1980); however, striking differences in the patterns among the attribution variables with mathematics achievement performances were revealed. Each of the relationships revealed in the U.S. and Japanese data will be addressed individually. When feasible, efforts will be made to provide potential explanations for the observed similarities and differences between the two countries.

Between- and Within- Country Differences in the Relationship Between Gender and Mathematics Performance

As expected, the relationship between gender and mathematics achievement performance in the U.S. was quite weak. Gender is not associated with high or low student achievement test performance. This finding is in no way surprising in light of the present emphasis on sexual equality in education in the U.S. today. In the U.S., not only do males and females have equivalent opportunities to study mathematics, but

parents, educators, and the population, in general, are particularly alert to the explicit as well as implicit socialization experiences that promote gender differences in mathematics achievement performance.

The findings in this study also supported the predicted relationship between gender and mathematics achievement in Japan and again upheld previous findings (Harnisch, in press). As expected, there is a rather strong relationship between gender and mathematics performance in Japan; i.e., Japanese males are associated with higher mathematics achievement scores while Japanese females are associated with lower mathematics achievement scores. Although, current information by the news media reports that equal numbers of Japanese males and Japanese females are being educated (O'Reilly & Tansman, 1983), implying sexual equality in education, careful scrutiny of this statistic reveals otherwise. Christopher (1983) also reports that the number of males and females who attend college is equal; however, he indicates that the vast majority of women attend two year colleges, major in "women's subjects" such as home economics with most of the males attending a four year university. Considering the selected areas of interest and the brief time spent in post-secondary schools by most Japanese females, upper level mathematics courses are not normally a part of their professional program of study. Female participation rates in mathematics curriculum are reflected in their mathematics achievement performance.

Relationship Between Test Comfort and Mathematics Achievement Performance

In keeping with previous findings (Hill, 1980; Willig, et al., 1983), this study found a relatively strong association between test comfort and mathematics achievement performance in the U.S. The upward trend reported in the results section indicates mathematics achievement performance is related to the level of comfort experienced by students during test-taking

activities; i.e., the more comfortable students report they are when taking tests, the higher their mathematics test scores. This relationship appears consistently in studies involving test anxiety and achievement performance in the U.S. Hill (1980) found anxiety is the main causal factor in the anxiety-performance relationship and reports that high anxious students can perform well on exams when conditions are designed to optimize their performance. In other words, when student anxiety is isolated and reduced, student test scores are increased. The experimental data by Hill and his colleagues further supports the trend found in this study.

The same relationship between test comfort and mathematics achievement performance is present in the Japanese data, but the association is much weaker. Whether this finding is sample specific or is generalizable across the student population will not be resolved in this study. Certainly, it is logical to assume as Hill (1976, 1980) suggested that the anxiety-performance relationship is present in many cultural contexts. However, Maehr and Nicholls (1980) point out when studying achievement motivation in different cultural contexts, caution is indicated before assuming that achievement behaviors and their attendent purposes and meanings are identical cross-culturally. This raises the issue that the purpose and meaning of exams in Japan as well as student test-taking behavior and the relationship between the three may well be different than in the U.S. Certainly there is some evidence that indicates this may be a viable explanation for the difference in the anxiety-performance relationship between the two countries.

In contrast to the U.S., the Japanese educational system employs a strict selection procedure that is based on entrance examinations given to students prior to high school and again before college entrance. Student entrance to an institution is based on his/her performance on this measure

only while the particular university a student attends profoundly influences a student's future career prospects. It is obvious, then, that students would be highly motivated to prepare for such examinations so they could enter the institution of their choice. Vogel (1979) discusses in some detail what entrance examinations represent in Japan. This discussion provides some explanation for why these single measures can dictate what high school and university a student attends which in turn ultimately determines a student's first career position.

The entrance examinations in Japan are considered to measure knowledge (Vogel, 1979). The underlying assumption governing these examinations is not that success on examimations represents innate ability, particular talents, or general aptitude. Rather, it indicates that the student is capable of utilizing ability for disciplined study. It is acknowledged that ability is a factor; however, disciplined study is considered to ultimately determine a student's score. Thus, the entrance examination indicates the level of discipline a student has attained as well as his/her mastery of a body of knowledge. Entrance exams in the U.S., in contrast, measure aptitude and/or attempt to predict future school success.

Given the weight these exams are granted in Japan, it is also likely that the entrance exams effect the meaning and purpose students attach to all exams as well as their behavior and the attitudes they possess. In general, in the U.S., there is no examination that is the sole criteria for determining admission to an institution of learning in the manner the entrance exams are in Japan. Certainly, in the U.S. exam scores are important, as well as attendance at a highly-rated university; however, it is part of the American dream that many opportunities will be present throughout a career. Alternatively in Japan, life-long success is dependent on performance on entrance exams when an individual is a senior

level student. Given the differences in selection procedures and exams, it is likely that the meaning, purpose, and student attitude toward school in conjunction with behavior while taking tests is not the same in Japan as in the U.S. It is likely these differences affect the Japanese educational experience in general. The relationship of the selection procedures and exams to the Japanese educational system and its students will be discussed further in the conclusion section of this paper.

Between-Country Differences in the Patterns of the Attribution Variables with Mathematics Achievement Performance

As predicted, in the U.S. data, the patterns of the attribution variables with mathematics achievement supported previous findings (Willig et al., 1983). The group who perceived that their success on tests was due to ability and attributed failure to lack of effort was rated high in a sense of competence. The mathematics achievement scores for this group whose sense of competence is based on the most facilitating attributions (Maehr & Nicholls, 1980) are, indeed, the highest. Alternatively, the group who attributed success to luck and failure to lack of ability were considered to feel a lack of competence. The group who was rated low in competence, possessing the most debilitating attributions suggested in the literature (Maehr & Nicholls, 1980), was associated with the lowest mathematics achievement scores. These findings further substantiate earlier analysis by Nicholls (1979). He indicates that students' perception of their academic achievement becomes more precise with age and that motivation and attributions reflect actual achievement as students develop intellectually. Given the age group of these students and the two very distinct groups that possess the high and low sense of competence, respectively, it is obvious these students have knowledge of their academic attainment and the attributions associated with it.

In the Japanese data, the patterns of the attribution variables associated with mathematics achievement are different than in the U.S. There were two groups associated with a high sense of competence. One pattern, i.e., for the group attributing success to ability and failure to lack of effort, is identical to the pattern observed in the U.S. However, the other pattern associated with a high sense of competence, i.e., the group attributing success to luck and failure to no luck, is quite incongruous with the pattern observed in the U.S., the other pattern in the Japanese data, and attribution theory, in general. There is only one group rated low in a sense of competence in the Japanese data. However, this group attributed success to effort and failure to lack of ability. Again this pattern does not resemble the pattern associated with a low sense of competence in the U.S. data.

One explanation that may account for these findings is that attribution theory in its present form is culture-specific. Maehr & Nicholls (1980) suggest this and further point out that hard work and ability may not be the most important antecedants of perceived success and failure in all cultures. Their preliminary data on motivation achievement in Japan indicate there are at least minor differences between the two cultures in this area with some modification of attribution theory necessary. Assuming that hard work and ability may not be the primary antecedents of perceived success and failure, and the potential cross-cultural differences in the purpose and meaning of achievement behavior, an examination of what constitutes a high sense of competence in the U.S. and Japan, respectively, is warranted.

Braskamp and Maehr (1983), from their research involving a sample of educated professional adults in the U.S., describe the motivation patterns associated with a group they designated as elite performers. They suggest

that a sense of competence is a requisite for elite performers and is evidenced in their self-esteem, self-reliance, and goal orientation. These individuals are motivated to seek power, excel, and in general, have confidence in their ability. Braskamp and Maehr (1983) also indicate these individuals have strong ego incentives, enjoy competition, and rigorous evaluation. They further suggest social approval or support is less important to elite performers. When examining these motivation patterns, it is quite clear a majority of them are grounded in the individual. Characteristics such as self-reliance, self-confidence, and competitiveness are representative of an individualistic phenomena.

By contrast, the group is considered of primary importance in Japan rather than the individual. Loyalty, cooperation, security, persistence, and dependence are characteristics that are associated with individuals and the group (Maehr & Nicholls, 1980). Successful individuals possess some of these characteristics and promote the remainder within the group. Developing competence to the best of one's individual ability is not a question, rather it is expected. Successful individuals are not only competent in the general sense; but more importantly, also demonstrate their competence by a proper affiliation with the group.

According to Maehr & Nicholls (1980), the concept of achievement in Japan is strongly related to group role and status with the origins in the context of the family. They propose that "the achievement question is not just 'Am I competent,' but 'Am I a good family member?'" (p. 251). It is a reasonable assumption then that the same achievement patterns extend quite naturally to the school setting and later in the workplace. Vogel's (1979) description of each individual school as a group and their competition with other schools to place students in high status universities suggest such patterns exist there also.

It is also likely that what constitutes a low sense of competence in the two countries is also different. Characteristics associated with a low sense of competence in the U.S. are low self-esteem, dependence, and desire for approval. Individuals with a low sense of competence avoid competition and rigorous evaluation and are without a strong goal orientation. Alternatively, as might be expected, in Japan, competence is not the only question. Morsbach (1980) indicates that the achievements of high ability individuals are supported only if the achievements are considered beneficial to the entire group with any other behavior actively discouraged. Slower members of the group are not left to their own devices, but rather are supported and respected as members of the group as long as they conform to group norms.

In summary, in comparing the characteristics associated with motivational patterns in the U.S. and Japan, respectively; it is clear there are significant differences. Characteristics associated with a high and low sense of competence in the U.S. are quite different than the characteristics considered necessary for achievement in Japan. Although it is desirable and even expected that one is competent in a general individual sense, competence within the group context is a primary measure of achievement in Japan. It is the individual's motivation pattern that is of interest in the U.S.; whereas, in Japan the individual's patterns of motivation are emphasized, but can be adequately assessed only within the context of a group.

Conclusion

Based on these findings, there are a number of implications for further research, particularly for the measurement of success-failure attributions cross-culturally and for future educational policy within the U.S.

Beginning with the measurement of the attribution patterns of success and failure within Japan, it is likely that at least minor adjustments are necessary to adequately assess these patterns. The present measures used in the U.S. do reveal patterns in Japan, but do not seem to reflect the effect of the group on an individual's attribution of success and failure. Interpretation of the patterns revealed in this data are at best incomplete, if not misleading, when only Western standards are applied. In particular, the attribution pattern of success to luck and failure to lack of luck associated with a high sense of competence in Japan is incomprehensible in the West. Western culture defines an implicit combination of ability and effort as the primary agents of success with any other outcome unlikely when this combination is present. Alternatively, failure is expected when this combination is not present. In contrast, in Japan, individual effort within the group context is expected and except for rare cases is produced, thus, effort is not a question. Ability is considered important, but in a different sense than in the West.

Ability is not the sole or even most important determinant in measuring success according to Japanese standards. It is conceivable for an individual who possesses high ability and puts forth a great deal of effort to perform inadequately on an entrance exam. Such results could permanently alter future opportunities. This type of situation is likely generalizable to all areas of Japanese life and is represented by a fatalistic attitude which is clearly not present in the majority culture in the U.S. Thus, it is reasonable for individuals in Japan to attribute failure to lack of luck. For example, the Japanese mothers credit effort as the key determinant of a child's achievement in school and foster this as a role for their children to cultivate. Furthermore, this tendency to meet the requirements of a role tend to be the primary motivators of

Japanese children and mothers. However, when the precise requirements of a role are not met, it is due, in most cases, to bad luck. On the other hand, in the U.S., it is highly improbable that an individual's future opportunities would be altered in a similar fashion on the basis of the results from one examination. In other situations, effort and ability are also considered the agents of success; therefore, failure is not due to lack of luck. Rather, the correct combination of ability and effort are not present. Thus, the Japanese response patterns for the success-failure attribution can be understood only when discussed in its proper cultural context.

These findings suggest that a more complete knowledge of the Japanese language, and culture is necessary before adequate instrumentation can be developed to measure the attribution of achievement in that country and before the results can be interpreted properly. This data suggests first hand knowledge by U.S. researchers as well as consultation with native Japanese are requisites for valid research in this area.

When addressing, "Why Japanese students are so highly motivated? and How are these motivation patterns generated?", it is clear from previous discussion that these patterns are quite complex and different than in the U.S. In Japan, the family and educational system work in conjunction to offer strong support to students. The educational system functions successfully because of the family attitude. Children are successful family members when they are successful students. The support by both groups is highly advantageous when considering only educational productivity. The selection procedures present in the educational system also provide tremendous motivation for students. However, there are problems associated with the examination system as it creates pressure for students to perform from kindergarten through high school and at home and

at school. It is clear that the educational system in Japan and its relationship to other structures in Japanese society is quite different than here in the U.S., as their system receives support from the family, business, government, etc. Thus, there are many more differences between the students and the educational systems in the two countries than there are similarities.

In regards to policy implications, the temptation is to condemn the U.S. educational system as incompetent on the basis of the gap in student performance between U.S. and Japan. Given the present concern (Boyer, 1983; National Commission on Excellence, 1983) by the entire U.S. population regarding the decline in the quality of education, these results appear to provide another piece of evidence that points to a deterioration in our educational system. However, it is quite clear from the discussion in this paper there are many differences between these two countries which go beyond the education system. Japan is clearly a homogeneous society; whereas, the U.S. is a heterogeneous society. Such differences also suggest that a condemnation of the U.S. system on the basis of the substantial gap in student scores on a mathematics achievement examination is unlikely to be appropriate. Providing educational services in the U.S. appears to be much more complex than in Japan as minority, poor, and other disadvantaged students are all of special concern. Given the heterogeneity present in the U.S., the family and school do not necessarily function as a support system for students. Rather, there may well be a conflict in one or more areas between the school and family.

The basic differences also suggest that any attempts to implement Japanese educational practices in the U.S. without consideration of such differences is unlikely to be successful. Or stated differently, even successful implementation of Japanese educational practices will not

guarantee a substantial increase in mathematics productivity in this country. However, adaptation of some practices could be beneficial to the U.S. educational system, its students, and the entire country.

Certainly the Japanese system lends support to the minimal competency examination which is currently being implemented in various states. It potentially offers the same benefits as the strict selection procedures employed in Japan without the problems associated with these procedures. A minimal competency examination could promote full literacy in the school populations as the selection procedures do, but wouldn't create the enormous pressure for students or encourage a track system as the entrance examinations do in Japan. Literate school populations would offer advantages to the U.S. marketplace and society, in general.

Another difference in the two educational systems is status awarded to teachers. In Japan, teaching is an honored profession with teachers highly regarded and respected individuals. They assume responsibilities for their students beyond classroom time serving as a mentor to both students and their families. This is in direct contrast to the U.S. where elementary and high school teachers possess little status. The teaching profession is not highly respected or regarded. If the teaching profession in the U.S. was more attractive, it is likely the quality of instruction would improve as more highly qualified individuals would select teaching as a profession.

In summary, current measures of achievement attribution are inadequate to assess motivational patterns in Japan. The present measures do not reflect the effect of the group on an individual's attribution of success and failure. A more complete knowledge of the Japanese language and its culture is necessary before adequate measures can be developed. In regards to policy implication, the substantial gap in between-country mathematics achievement performance does not necessarily represent an enormous decline

in the quality of U.S. education. Certainly, Japanese students achieved much higher scores on this mathematics achievement examination than did their U.S. peers. However, any policy recommendations on the basis of a superficial comparison betweeen the students' scores is hardly appropriate, given the basic differences between the two countries. Some adaptations of Japanese educational practices applied to the U.S. educational system may be a productive method for improving mathematics achievement. However the application of such practices will not insure equivalent mathematics achievement performance by U.S. students.

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Table 1

Proportion of Sample by Sex and Age for Japan and the United States

Variable	Country	
	U.S. (N = 9582)	Japan (N = 1700)
Sex		
Male	.50	.58
Female	.50	.42
Age		
15	.07	.27
16	.80	.36
17	.11	.31
18 or older	.02	.06

Proportions may not add to 1.00 due to rounding.

Table 2

Correlations Among the Achievement, Sex, Test Comfort, and Attribution Variables for Japan and the United States

Variables	1	2	3	4a	4b	4c	4d	5a	5b	5c	5d
1. Math achievement	1.00	.28	-.03	.35	-.09	-.16	-.10	-.07	.02	-.06	.03
2. Test comfort	.13	1.00	-.17	.29	-.04	-.17	-.10	-.10	.04	-.02	.01
3. Sex	-.32	-.16	1.00	-.16	.16	-.02	-.05	-.02	.05	-.07	-.02
4. Success attributed to											
a. ability	.07	.15	-.11	1.00	-.53	-.14	-.17	.04	-.08	-.02	.08
b. effort	-.08	-.10	.09	-.19	1.00	-.42	-.50	-.15	.28	-.16	-.18
c. luck	.09	-.01	-.02	-.07	-.57	1.00	-.13	.16	-.15	.30	.04
d. easy task	-.01	.08	-.04	-.08	-.59	-.24	1.00	.03	-.19	-.02	.20
5. Failure attributed to											
a. lack of ability	-.02	.03	-.06	.23	-.16	.11	.00	1.00	-.32	-.03	-.09
b. lack of effort	-.04	-.11	.13	-.19	.31	-.16	-.13	-.45	1.00	-.31	-.83
c. lack of luck	.12	.07	-.13	.13	-.23	.30	-.05	-.05	-.46	1.00	-.08
d. hard task	-.03	.07	-.03	.00	-.12	-.07	.23	-.07	-.66	-.07	1.00

Correlations in the upper right triangle are for the United States sample while the lower left triangle contains the correlations for the Japanese sample.

Sex is coded 1 for males and 2 for females.

Table 3

Proportion of Sample in Each of the Sixteen Attribution Cells for Japan and the United States

		Failure Attributed to			
Success Attributed to	Country	Lack of Ability	Lack of Effort	Lack of Luck	Hard Task
1. Ability	U.S.	.007	.100	.004	.038
	Japan	.008	.008	.005	.002
2. Effort	U.S.	.007	.524	.005	.079
	Japan	.011	.540	.004	.037
3. Luck	U.S.	.012	.055	.019	.013
	Japan	.018	.126	.034	.009
4. Easy task	U.S.	.006	.075	.003	.052
	Japan	.009	.141	.005	.044

Proportions may not add up to 1.00 due to rounding.

Table 4

Proportion of Sample at Each Level of the Test Comfort Scale for Japan and the United States

	Test Comfort Scale							
	Low							High
Country	0	1	2	3	4	5	6	7
U.S.	.13	.14	.17	.15	.13	.11	.11	.05
Japan	.15	.19	.18	.16	.14	.13	.03	.01

Proportions may not add up to 1.00 due to rounding.

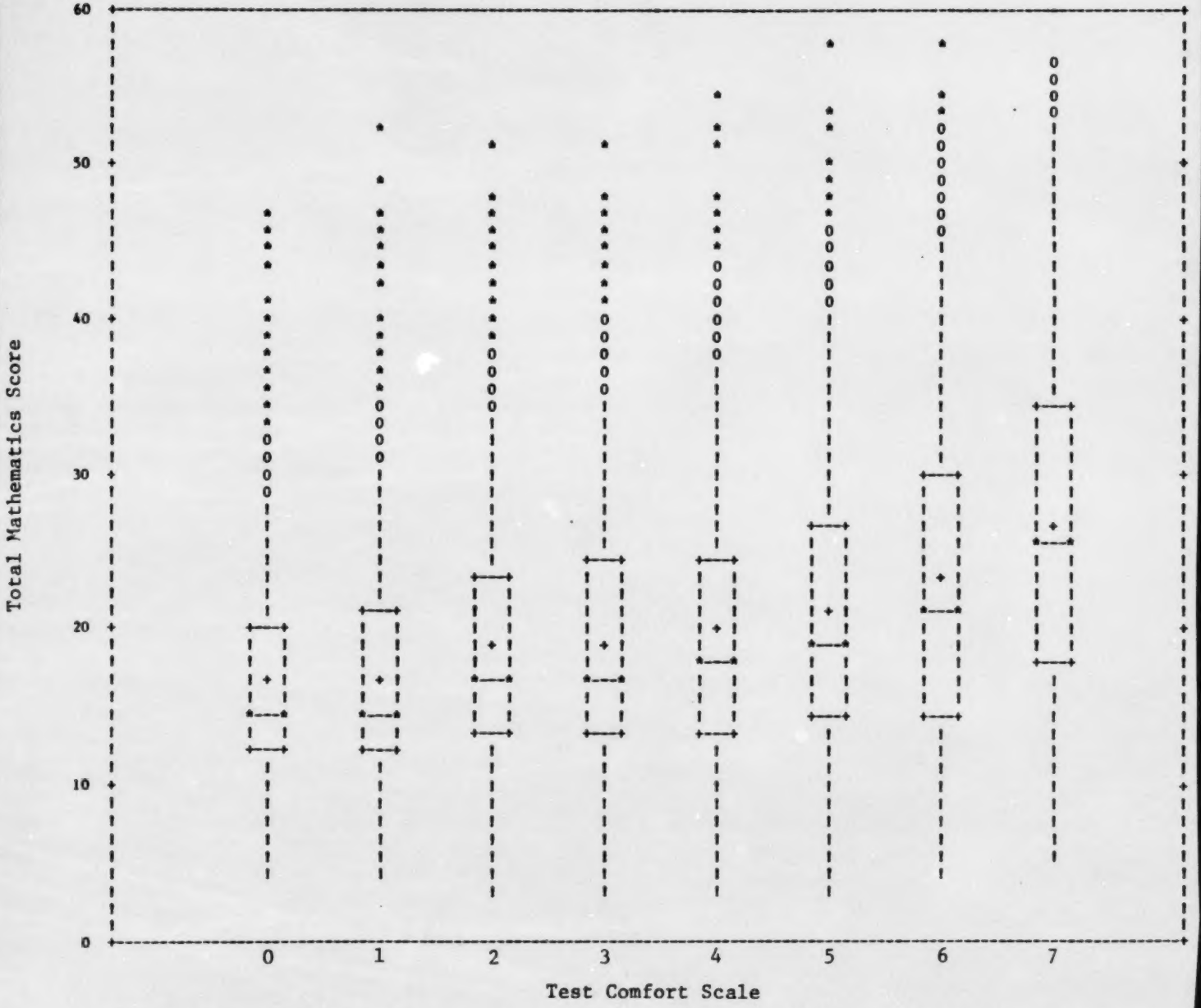

Figure 1. Box and Whisker Plot of the Total Mathematics Score at Each Score Level on the Test Comfort Scale for Secondary Students in the United States (N = 9582)

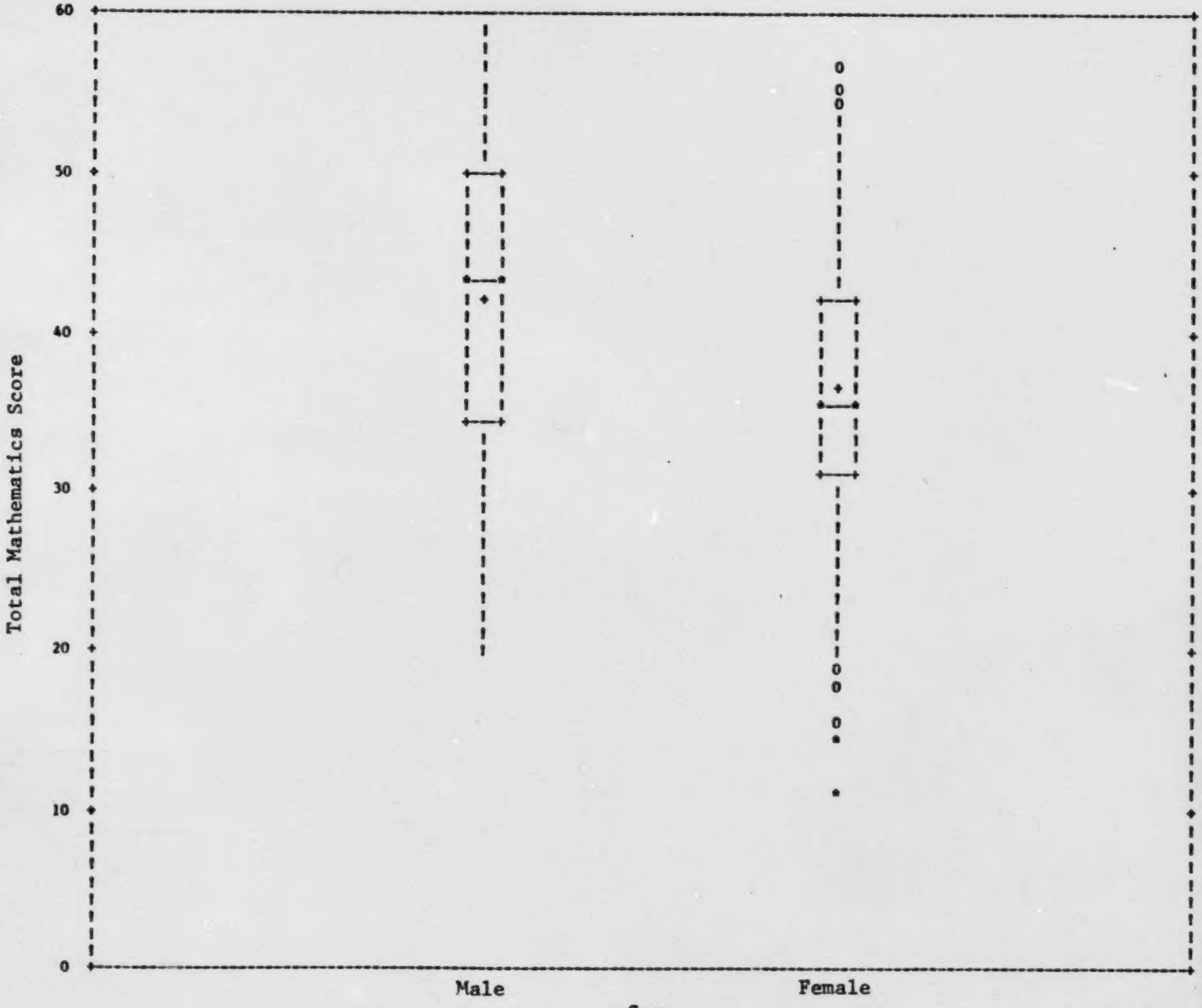

Figure 2. Box and Whisker Plot of the Total Mathematics Score for Male and Female Secondary Students in Japan (N = 1700)

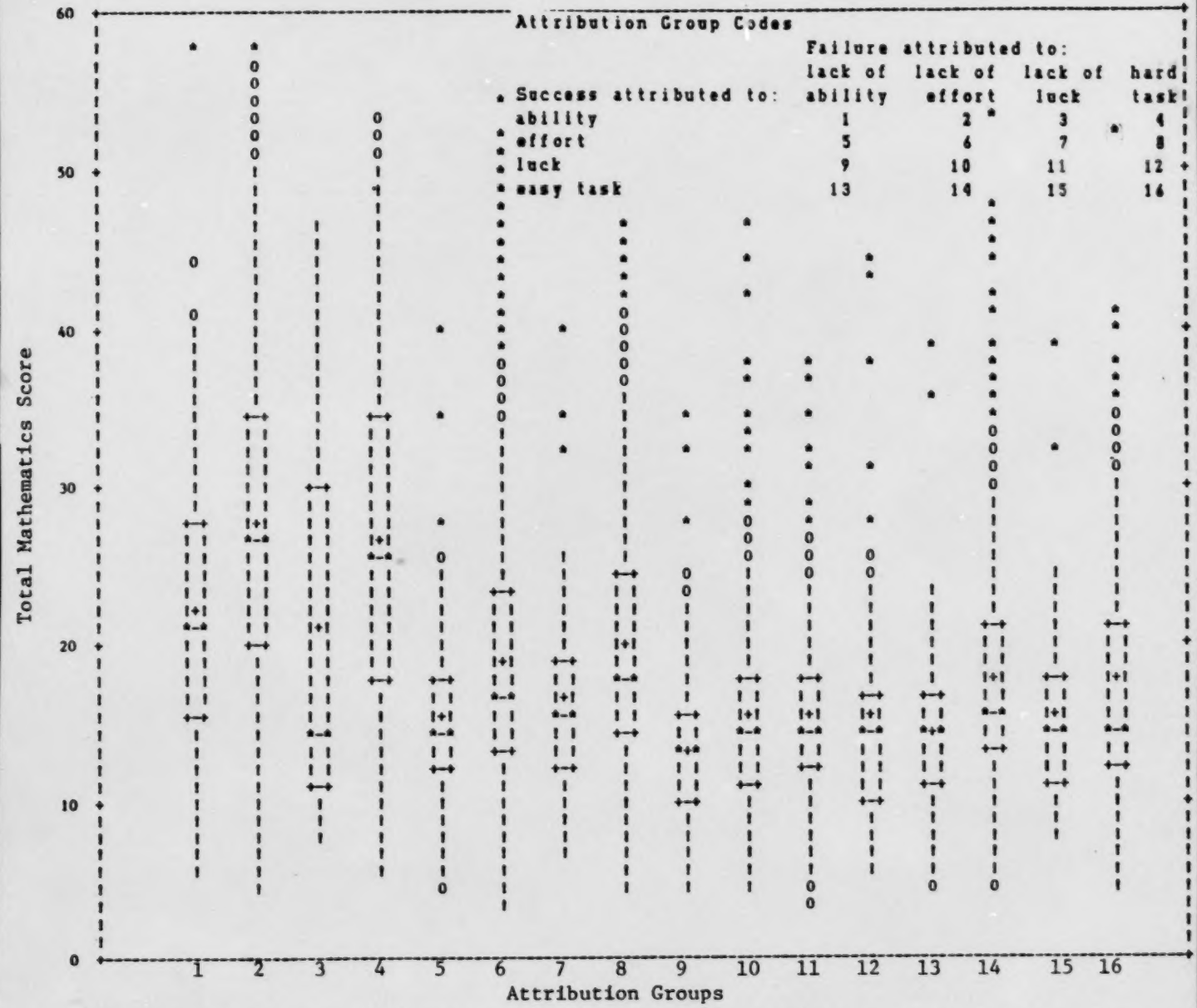

Figure 3. Box and Whisker Plot of the Total Mathematics Score for Sixteen Attribution Groups Formed for Secondary Students in the United States (N = 9582)

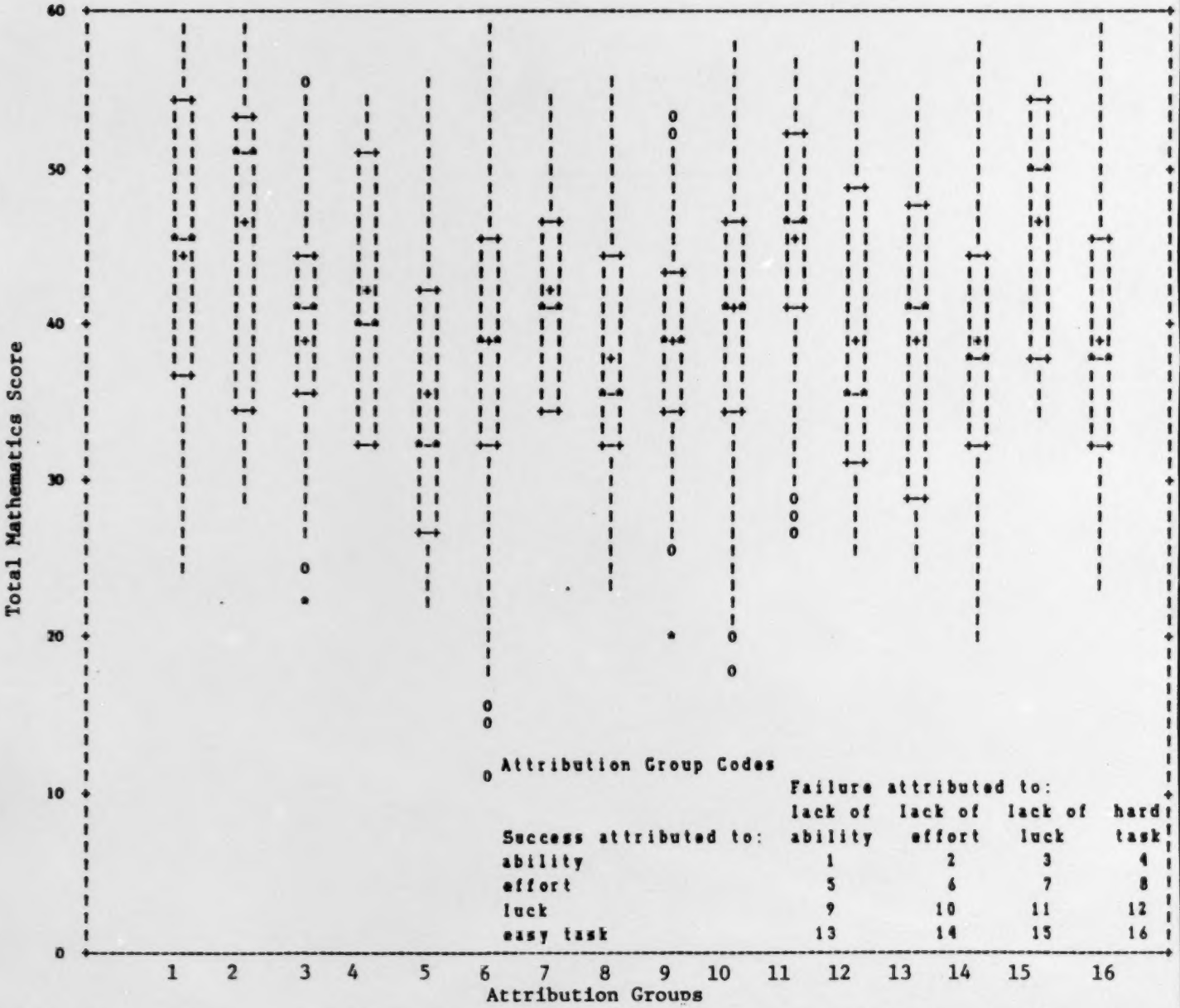
Total Mathematics Score
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Attribution Groups
Attribution Group Codes
Failure attributed to:
Success attributed to: lack of ability | lack of effort | lack of luck | hard task
ability 1 2 3 4
effort 5 6 7 8
luck 9 10 11 12
easy task 13 14 15 16

Figure 4. Box and Whisker Plot of the Total Mathematics Score for Sixteen Attribution Groups Formed for Secondary Students in Japan (N = 1700)